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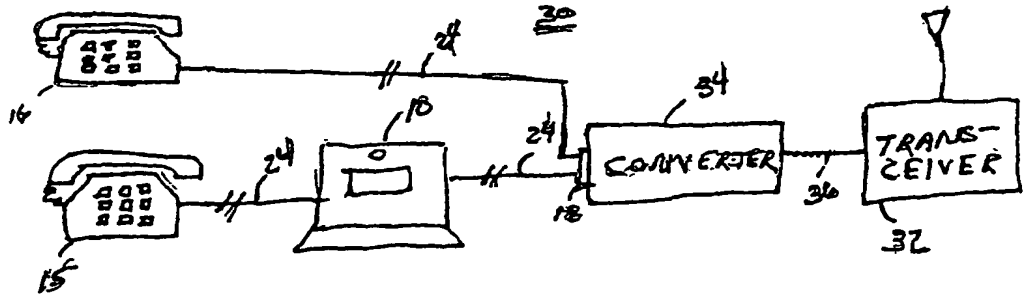
(54) Title: WIRELESS VIDEOPHONE AND CONVERTER



(57) Abstract: A wireless videophone (30) comprises a landline-based videophone (10), a transceiver (32), and a converter (34). The landline-based videophone has a two-wire communication path (24), wherein the two-wire communication path conducts an outgoing audio-video signal generated by the landline-based videophone. The transceiver has a four-wire communication path (36), wherein the four-wire communication path has a transmit path, a receive path, and a shared ground. The converter includes a transmit terminal (40) for applying a transmit signal to the transmit path, a receive terminal (44) for accepting a receive signal from the receiver path, and a common ground terminal (46) for coupling to the shared ground. The converter is responsive to the outgoing audio-video signal to provide the transmit original to the transmit, and is responsive to the receive original to provide the receive signal to the landline-based videophone. The converter can optionally have a call-exchange circuit (56) that identifies the telephone the call is intended.

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WIRELESS VIDEOPHONE AND CONVERTER

BACKGROUND OF THE INVENTION

Field of The Invention:

The present invention relates generally to the field of videophones, and, more particularly, to a wireless videophone and a convertor that converts a landline-based vidoephone it into a wireless videophone.

Description of the Related Art:

Over the last few years, commercially viable landline-based videophones have been available. Stand-alone high-end videoconferencing systems for the meeting room, with large screens (31 inches and up) and hefty price tags ($40,000 and up), are now fairly common in major corporations. These price ranges put this technology out of the reach of most consumers.

The latest in landline-based videophones are personal computer (PC) based videoconferencing systems that sell for as little as $199 and over $1000. These systems typically include a camera, a video capture board to install in the PC, and software, for example, Intel's VideoPhone, or Microsoft's NetMeeting. Some kits have a built-in modem or integrated services digital network (ISDN) adapter.

There are several ways to videoconference from the desktop: directly over the phone line, directly over an ISDN connection, over a local-area network (LAN), and through the Internet. The more bandwidth available for sending the video and audio from one desktop to another, the better the audio and image quality. Phone lines provide the least bandwidth whereas LAN connections offer the most.

The cheapest way to videoconference from the desktop is over the Internet for geographically dispersed sites. Unfortunately, conferencing over the Internet via the phone lines is limited to a 176-by-144-pixel image and only several frames per second (fps) with reasonable size, for example, two inches by two inches. This is a very jerky moving image. In comparison, normal television images are displayed at 30 fps, and movie films are

displayed at 24 fps. Furthermore, internet traffic jams can degrade that frame rate to zero and garble the audio beyond recognition.

An improvement in cost and quality is a direct connection between two modems. Because the line is not shared with everyone else on the Internet, video quality is often better: Sharper images appear at rates of up to 8 fps, which is still jerky. Moreover, a conference across telephone lines tops out at 33.6 kbps for full duplex analog transmissions.

Some modem-connected videophones use compression technology increase the image rate to 15 fps. One such videophone is model number vc150 available from 8x8, Inc., of Santa Clara, California. FIG. 1 is a simplified representation of the connection of a vc150. The landline-based videophone 10 includes a flat panel display 12 for displaying images and a camera 14. Inside the videophone is a video processing chip and an analog modem. A first touch-tone telephone 15, coupled to the videophone by a standard phone cord 24, can be used for making and receiving calls and as a microphone and speaker. The keys 17 on the keypad can be used to control the videophone. Telephone 16 is coupled to the videophone by a standard two-wire phone cord 24. The number of slashes indicate the number of wires.

The videophone is also connected to a standard Plain Old Telephone Service (POTS) RJ-11 telephone wall jack 18, which is connected to the Public Telephone Service Network 20. Calls are made over standard telephone lines 22.

Each party to a conference call would have compatible videophone. Video calls start as a standard telephone call. Once an audio call is established, pressing the proper keys starts a video call. Once a video call is established, the caller controls the phone using a series of on-screen menus. The user ends the call by hanging up.

The third type of connection--a direct link between two ISDN adapters--offers almost four times the bandwidth of a modem-to-modem connection and improves video quality substantially. ISDN uses digital transmission between the subscriber and the Central Office. Up to 15 fps can be obtained. Unfortunately, ISDN is a relatively costly option, assuming

it's even available. Furthermore, ISDN systems cannot connect directly with a PC using an analog modem because of incompatible standards.

Finally, a videoconference can be made over a LAN. Though ethernets transmit 10 to 100 megabits per second, this rate is divvied up among the dozens or even hundreds of people on the LAN. The highest video bit rate is typically about 300 kbps. That is fast enough for images to appear with just a hint of jaggedness. However, if you want to talk to someone at a remote location, the videoconference will have to travel over a wide area network (WAN) connection, which may not be fast enough. If the WAN uses 64-kbps leased lines, the image is sharply degraded. If it has 1.5-mbps T1 lines, image quality may be acceptable.

In addition to the aforementioned problems, all of these videoconferencing systems have the disadvantage of requiring a landline connection. The required landline connections make them unsuitable for applications were a landline connection is not available.

An adapter for lap top computers is known that frees the lap top computer from a landline connection. The adapter uses cordless transmission speeds of 28.8 kbps, which is too slow for quality images.

Recently, a wireless videophone has been introduced for the Japanese market. The mobile videophone is the same size as any normal mobile phone, but it comes equipped with a small built-in camera and a two-inch color LCD screen. Along with the audio signal, it transmits and receives images in real time at a rate of about 2 fps. Thus the image quality is poor and jerky. Moreover, this phone is designed to be used for the Personal Handyphone System format, which is not available in the United States and other countries outside of Japan.

A need therefore exists for a wireless videophone that provides an image quality that exceeds current wireless videophones.

BRIEF SUMMARY OF THE INVENTION

The present invention, which tends to address this need, resides in a wireless videophone and a converter for a landline-based vidoephone that converts it to a wireless videophone. The wireless videophone described herein provide advantages over known landline- and wireless-based videophones in that it provides a vidoephone that is free of landline connections and provides an image quality that exceeds current wireless videophones. Further, the converter provides a call-exchange feature, which is not available in wireless videoconferencing systems.

According to the present invention, a converter converts a landline-based videophone having a two-wire communication path and a transceiver having a four-wire communication path into a wireless videophone. The two-wire communication path conducts an outgoing audio-video signal generated by the landline-based videophone. The four-wire communication path has a transmit path, a receive path, and a shared ground. The converter comprises a transmit terminal for applying a transmit signal to the transmit path, a receive terminal for accepting a receive signal from the receive path, and a common ground terminal coupled to the shared ground. The converter further comprises a mixer/separator circuit, coupled to the two-wire communication path, the transmit terminal, the receive terminal, and the common ground terminal. The converter is responsive to the outgoing audio-video signal to provide the outgoing audio-video signal to the transmit terminal, and is responsive to the receive signal to provide the receive signal to the two-wire communication path. Thus, the converter converts the landline-based videophone into a wireless videophone that is free of landline connections and can provide an image quality that exceeds current wireless videophones

In accordance with one aspect of the present invention, the receive signal includes an incoming call signal and an incoming audio-video signal, and the converter further comprises a call exchange circuit for identifying the telephone the call is intended and supplying a ring signal in response to the incoming call signal. A telephone rings in response to the ring signal. Thus, the converter provides a call-exchange feature, which is not available in wireless videoconferencing systems.

Other features and advantages of the present invention will be set forth in part in the description which follows and accompanying drawings, wherein the preferred embodiments of the present invention are described and shown, and in part become apparent to those skilled in the art upon examination of the following detailed description taken in conjunction with the accompanying drawings, or may be learned by practice of the present invention. The advantages of the present invention may be realized and attained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a simplified representation of the connection of a convenional landline-based videophone.

FIG. 2 is a simplified representation of a wireless videophone configured according to the present invention.

FIG. 3 is a functional block diagram of the converter shown in FIG. 2.

FIG. 4 is an electrical schematic of a detailed embodiment of the converter shown in FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in the exemplary drawings, and with particular reference to FIG. 2, which is a simplified representation of a wireless videophone 30 configured according to the present invention, the present invention is embodied in a wireless videophone comprising a first touch-tone telephone 15, a second touch-tone telephone 16, a landline videophone 10, a converter 34, and a transceiver 32.

The landline-based videophone 10 and first telephone 15 are connected as described in the Background. First telephone 15 is used to operate the landline-based videophone 10. The second telephone 6 is used to answer and initiate calls and provide a speaker and microphone. In the preferred embodiment, the landline-based videophone is model number vc150 by 8x8, Inc.

The converter 34 couples the second telephone 16 and the landline-based videophone 10 to the transceiver 32. The second telephone 16 and the landline-based videophone are coupled with the converter by a standard telephone cord 24 and RJ-11 jack 18. The

landline-based videophone has a two-wire communication path, such as telephone cord 24. The two-wire communication path conducts an outgoing audio-video signal generated by the landline-based videophone.

The transceiver 32 can be any device that can transmit and receive radio-frequency signals, such as, a 2-meter radio or an analog cellular radiotelephone. An example of a 2-meter radio that can be employed is model number SP50 available from Motorola, Inc., of Schaumburg, Illinois. The transceiver has a four-wire communication path 36. The four-wire communication path has a transmit path, a receive path, and a shared ground.

FIG. 3 is a functional block diagram of the converter 34 shown in FIG. 2, configured according to the present invention. The converter comprises a transmit terminal 40 for applying a transmit signal 42 to the transmit path, a receive terminal 44 for accepting a receive signal 43 from the receive path, and a common ground terminal 46 for coupling to the shared ground of the transceiver.

The converter 34 also includes a mixer/separator circuit 47 coupled to the two-wire communication path 24, the transmit terminal 40, the receive terminal 44, and the common ground terminal 46. Buffered op-amps 48,50 are used to isolate the transmit path and the receive path from the mixer/separator circuit. The mixer/separator circuit is responsive to the outgoing audio-video signal supplied by the landline-based videophone 10 to provide the outgoing audio-video signal to the transmit terminal. It also is responsive to the receive signal to provide the receive signal to the two-wire communication path 24.

The converter 34 also includes a phone jack interface 18 for coupling the two-wire communication path 24 to the mixer/separator circuit 47 by way of an optional on-off hook switch 52 and an impedance matching circuit 54. The impedance matching circuit matches the impedance of the mixer/separator circuit to the phone jack interface.

Accordingly, the outgoing audio-video signal of the landline-based videophone 10 can be transmitted by the transceiver 32; and transmitted signals, for example, from a complementary equipped wireless videophone, can be received by the transceiver and supplied to the landline-based videophone. Thus, the converter 34 converts the landline-

based videophone into a wireless videophone that is free of landline connections and provides an image quality that exceeds current wireless videophones. In the preferred embodiment, data transmission speeds of up to 33 kbps in each direction (66 kbps in the aggregate) and image rates of 15 fps have been achieved for transceiver to transceiver communications that avoid landline connections.

The receive signal includes an incoming audio-video signal and a preceding optional incoming call signal. The optional incoming call signal is required when a cellular telephone is not used for the transceiver. The incoming call signal is used to identify which telephone the call is for. Optionally, for a non-cellular transceiver, the converter further includes a call exchange circuit 56, coupled with the receive terminal 44, for supplying a ring signal 58 in response to the incoming call signal.

The on-off hook switch 52 is configured to couple the phone jack interface 18 with either the impedance matching circuit 54 or the call exchange circuit. The on-off hook switch is responsive to a switch control signal provided by the second telephone 16 for selecting either the impedance matching circuit or call exchange circuit.

When the on-off hook switch is in its normal on-hook position, the phone jack interface 18 is coupled to the call exchange circuit 56, and the ring signal 58 is applied to the phone jack interface. Thus, a communication path to the second telephone 16 is established, and the second telephone will ring when the ring signal is generated.

When the on-off hook switch 52 is in an off-hook position, that is, a call is being established or is in progress, the phone jack interface 18 is coupled to the impedance matching circuit 54, and the incoming audio-video signal is applied to the phone jack by way of mixer/separator circuit 47, impedance matching circuit 54, and on-off hook switch 52. The outgoing audio visual signal generated by the landline-based videophone 10 follows the opposite route to transmit terminal 40. Thus full-duplex audio-video communication is established.

If the transceiver is a cellular telephone, the on-off hook switch 52 and call exchange circuit 56 can be eliminated, as the cellular system has its own call-exchange feature.

The call exchange circuit 56 includes a dual-tone multi-frequency (DTMF) decoder 62, a delay driver 64, a ring driver 66, and a ring voltage generator 68.

The DTMF decoder 62 is coupled to the receive terminal 44 by way of buffered op-amp 50. The DTMF decoder decodes the incoming call signal and provides a call-for signal 70 in response to a code match. The code can be, for example, any number from 0 to 99,9999 corresponding to current telephone exchange designation.

The delay driver 64 stabilizes and enhances sensitivity of the call-for signal to produce a delay signal 71. For example, delay driver 64 creates a signal that determines the duration, for example, 40 seconds, of the periodic ringing of the first telephone 15.

The ring driver and timer 66 provides a pulsed-power signal 72 in response to the call-for signal 70.

The ring voltage generator 68 provides ring signal 58, which is a high-power pulsed signal, in response to the pulsed-power signal 72.

FIG. 4 is an electrical schematic of a detailed embodiment of the converter shown in FIG. 2. Where appropriate the same reference numerals are used to avoid unnecessary duplication and description of similar elements already referred to and described above. One of ordinary skill will readily be able to construct the converter and understand its operation from the electrical schematic, as it employs standard electrical compenents and architecture. Only the significant components will be discussed hereafter.

In this particular embodiment, DTMF decoder 62 uses touch-tone decoder chip 145436 that converts the touch-tones coming in on the call-for signal into one of 16 possible single digit numbers corresponding to 4-digit number address. A skilled artisan will appreciate that a rotary dial decoder chip can be employed and that the number of addresses and digits can be scaled upwards. DTMF decoder 62 also uses a demultiplexer chip 74L154 to decode the address and activate one of sixteen output lines. In this particlar embodiment, the address is hardwired to only output the address of "1."

Delay driver 64 determines the ring duration by the selection of the value of the gate resistor and capacitor. In this embodiment, the duration is approximately 47 seconds.

Ring driver and timer 66 is an oscillator circuit that starts oscillating upon receipt of the delay signal 71. The length of the ring is determined by the the value of the gate resistor and capacitor. In this embodiment, the ring is for approximately 1.6 seconds.

The ring voltage generator 68 amplifies the pulsed-power signal 72 to about 80 volts. Thus, when the double-pole, double-throw switch of on-off hook switch 52 is closed (the on-hook position), the ring signal is applied to second telephone 16 by way phone jack interface 18.

The call is answered by picking up on second telephone 16. When the handset is picked up, the load of the second telephone 16 greatly decreases causing the switch control signal 60 to be generated, which is the current flowing from the 12 volt power supply through the 35 ohm resistor. Thus, the transistor of on-off hook switch 52 turns on. This in turn drives the double-pole, double-throw switch open (the off-hook position).

The mixer/separator circuit 47 includes a first primary winding, a second primary winding, a first secondary winding, a second secondary winding, a first variable resistor, a second variable resistor, and an inductor. Each of these components have a first end and a second end. Furthermore, the first variable resistor, the second variable resistor, and the inductor each have a tap terminal.

The second end of the first primary winding and the first end of the second primary winding are coupled to series-connect the first primary winding and the second primary winding. The first end of the first primary winding and the second end of the second primary winding are coupled to the two-wire communication path.

The second end of the first secondary winding and the first end of the second secondary winding are coupled to series-connect the first secondary winding and the second secondary winding.

The first end of the first variable resistor is coupled with the first end of the first secondary winding, and the second end of the first variable resistor is coupled with the first end of the inductor. The second end of the second variable resistor is coupled with the second end of the second secondary winding, and the first end of the second variable resistor is coupled with the second end of the inductor.

To complete the connection of the mixer/separator circuit, the tap terminal of the first variable resistor is coupled with the transmit terminal 40, the tap terminal of the second variable resistor is coupled with the receive terminal 44, and the tap terminal of the inductor is coupled with the common ground terminal 46.

The first variable resistor and the second variable resistor are used to balance the transmit 42 and the receive signal 43.

In conclusion, the wireless telephone described herein provide advantages over known landline- and wireless-based videophones in that it provides a vidoephone that is free of landline connections and provides an image quality that exceeds current wireless videophones. Further, the converter provides a call-exchange feature, which is not available in wireless videoconferencing systems.

Those skilled in the art will recognize that other modifications and variations can be made in the converter and wireless telephone of the present invention and in construction and operation of this converter and wireless telephone without departing from the scope or spirit of this invention.

CLAIMS

1. A converter for converting a landline-based videophone having a two-wire communication path and a transceiver having a four-wire communication path into a wireless videophone, wherein the two-wire communication path conducts an outgoing audio-video signal generated by the landline-based videophone, and the four-wire communication path has a transmit path, a receive path, and a shared ground, the converter comprising:

a transmit terminal for applying a transmit signal to the transmit path;

a receive terminal for accepting a receive signal from the receive path;

a common ground terminal for coupling to the shared ground; and

a mixer/separator circuit, coupled to the two-wire communication path, the transmit terminal, the receive terminal, and the common ground terminal, responsive to the outgoing audio-video signal to provide the outgoing audio-video signal to the transmit terminal, and responsive to the receive signal to provide the receive signal to the two-wire communication path.

2. The converter of claim 1, wherein the receive signal includes an incoming call signal and an incoming audio-video signal, the converter further comprising:

a call exchange circuit, coupled with the receive terminal, for supplying a ring signal in response to the incoming call signal; and

an on-off hook switch, configured to couple the two-wire communication path with either the mixer/separator circuit or the call exchange circuit, responsive to a switch control signal provided by a telephone coupled with the on-off hook switch, for selecting either the mixer/separator circuit or the call exchange circuit;

wherein, when the on-off hook switch is in an on-hook position, the two-wire communication path is coupled to the call exchange circuit and the ring signal is applied to the two-wire communication path, and, when the on-off hook switch is in an off-hook position, the two-wire communication path is coupled to the mixer/separator circuit and the incoming audio-video signal is applied to the two-wire communication path.

3. The converter of claim 2, the call exchange circuit including:

a dual-tone multi-frequency decoder, coupled to the receive terminal, for decoding the incoming call signal and providing a call-for signal in response to code match;

a delay driver, coupled to the dual-tone multi-frequency decoder, for providing a delay signal in response to the call-for signal;

a ring driver and timer for providing a pulsed-power signal in response to the call-for signal; and

a ring voltage generator for providing the ring signal in response to the pulsed-power signal.

4. The converter of claim 1 further comprising a phone jack interface for coupling the two-wire communication path to the mixer/separator circuit.

5. The converter of claim 1 further comprising an impedance matching circuit for matching the impedance of the mixer/separator circuit to the two-wire communication path.

6. The converter of claim 1, wherein the transceiver is a cellular telephone.

7. The converter of claim 1, wherein the mixer/separator circuit includes:

a first primary winding having a first end and a second end;

a second primary winding having a first end and a second end, wherein the second end of the first primary winding and the first end of the second primary winding are coupled to series-connect the first primary winding and the second primary winding, and the first end of the first primary winding and the second end of the second primary winding are coupled to the two-wire communication path;

a first secondary winding having a first end and a second end;

a second secondary winding having a first end and a second end, wherein the second end of the first secondary winding and the first end of the second secondary winding are coupled to series-connect the first secondary winding and the second secondary winding;

a first variable resistor having a first end, a second end, and a tap terminal;

a second variable resistor having a first end, a second end, and a tap terminal;

an inductor having a first end, a second end, and a tap terminal:

wherein the first end of the first variable resistor is coupled with the first end of the first secondary winding, the second end of the first variable resistor is coupled with the first

end of the inductor, the second end of the second variable resistor is coupled with the second end of the second secondary winding, the first end of the second variable resistor is coupled with the second end of the inductor, the tap terminal of the first variable resistor is coupled with the transmit terminal, the tap terminal of the second variable resistor is coupled with the receive terminal, and the tap terminal of the inductor is coupled with the common ground terminal.

8. A wireless videophone comprising:

a landline-based videophone having a two-wire communication path, wherein the two-wire communication path conducts an outgoing audio-video signal generated by the landline-based videophone;

a wireless telephone having a four-wire communication path, wherein the four-wire communication path has a transmit path, a receive path, and a shared ground; and

a converter including,

a transmit terminal for applying a transmit signal to the transmit path,

a receive terminal for accepting a receive signal from the receive path,

a common ground terminal for coupling to the shared ground,

a mixer/separator circuit, coupled to the transmit terminal, the receive terminal, and the common ground terminal, and

a phone jack interface for coupling the two-wire communication path to the mixer/separator circuit;

wherein the mixer/separator circuit is responsive to the outgoing audio-video signal to provide the transmit signal to the transmit terminal, and responsive to the receive signal to provide the receive signal to the phone jack interface.

9. The wireless videophone of claim 8, wherein the receive signal includes an incoming call signal and an incoming audio-video signal, the converter further comprising:

a call exchange circuit, coupled with the receive terminal, for supplying a ring signal in response to the incoming call signal; and

an on-off hook switch, configured to couple the two-wire communication path with either the mixer/separator circuit or the call exchange circuit, responsive to a switch control

signal provided by a telephone coupled with the on-off hook switch, for selecting either the mixer/separator circuit or the call exchange circuit;

wherein, when the on-off hook switch is in an on-hook position, the two-wire communication path is coupled to the call exchange circuit and the ring signal is applied to the two-wire communication path, and, when the on-off hook switch is in an off-hook position, the two-wire communication path is coupled to the mixer/separator circuit and the incoming audio-video signal is applied to the two-wire communication path.

10. The wireless videophone of claim 9, the call exchange circuit including:

a dual-tone multi-frequency decoder, coupled to the receive terminal, for decoding the incoming call signal and providing a call-for signal in response to code match;

a delay driver, coupled to the dual-tone multi-frequency decoder, for providing a delay signal in response to the call-for signal;

a ring driver and timer for providing a pulsed-power signal in response to the call-for signal; and

a ring voltage generator for providing the ring signal in response to the pulsed-power signal.

11. The wireless videophone of claim 8, wherein the transceiver is a cellular telephone.

12. The wireless videophone of claim 8, wherein the mixer/separator circuit includes:

a first primary winding having a first end and a second end;

a second primary winding having a first end and a second end, wherein the second end of the first primary winding and the first end of the second primary winding are coupled to series-connect the first primary winding and the second primary winding, and the first end of the first primary winding and the second end of the second primary winding are coupled to the two-wire communication path;

a first secondary winding having a first end and a second end;

a second secondary winding having a first end and a second end, wherein the second end of the first secondary winding and the first end of the second secondary winding are coupled to series-connect the first secondary winding and the second secondary winding;

a first variable resistor having a first end, a second end, and a tap terminal;

a second variable resistor having a first end, a second end, and a tap terminal;

an inductor having a first end, a second end, and a tap terminal;

wherein the first end of the first variable resistor is coupled with the first end of the first secondary winding, the second end of the first variable resistor is coupled with the first end of the inductor, the second end of the second variable resistor is coupled with the second end of the second secondary winding, the first end of the second variable resistor is coupled with the second end of the inductor, the tap terminal of the first variable resistor is coupled with the transmit terminal, the tap terminal of the second variable resistor is coupled with the receive terminal, and the tap terminal of the inductor is coupled with the common ground terminal.

PRIOR ART

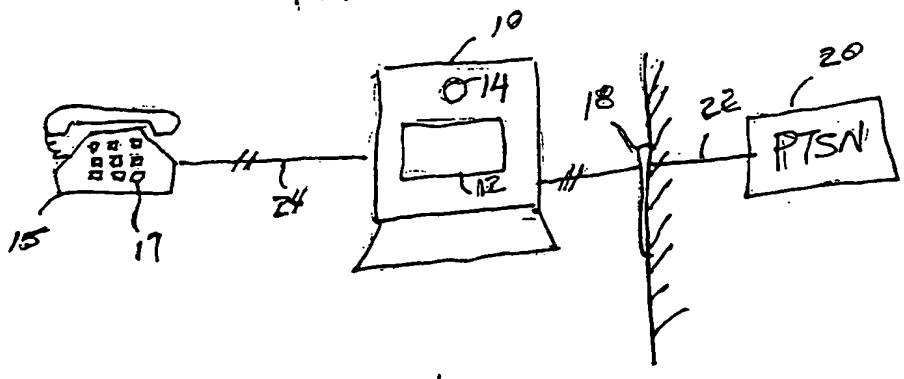

FIG. 1

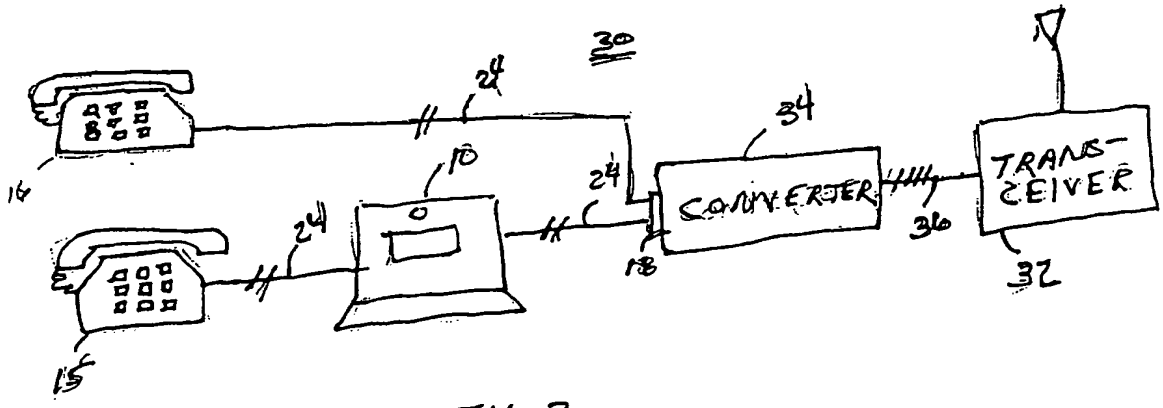

FIG. 2

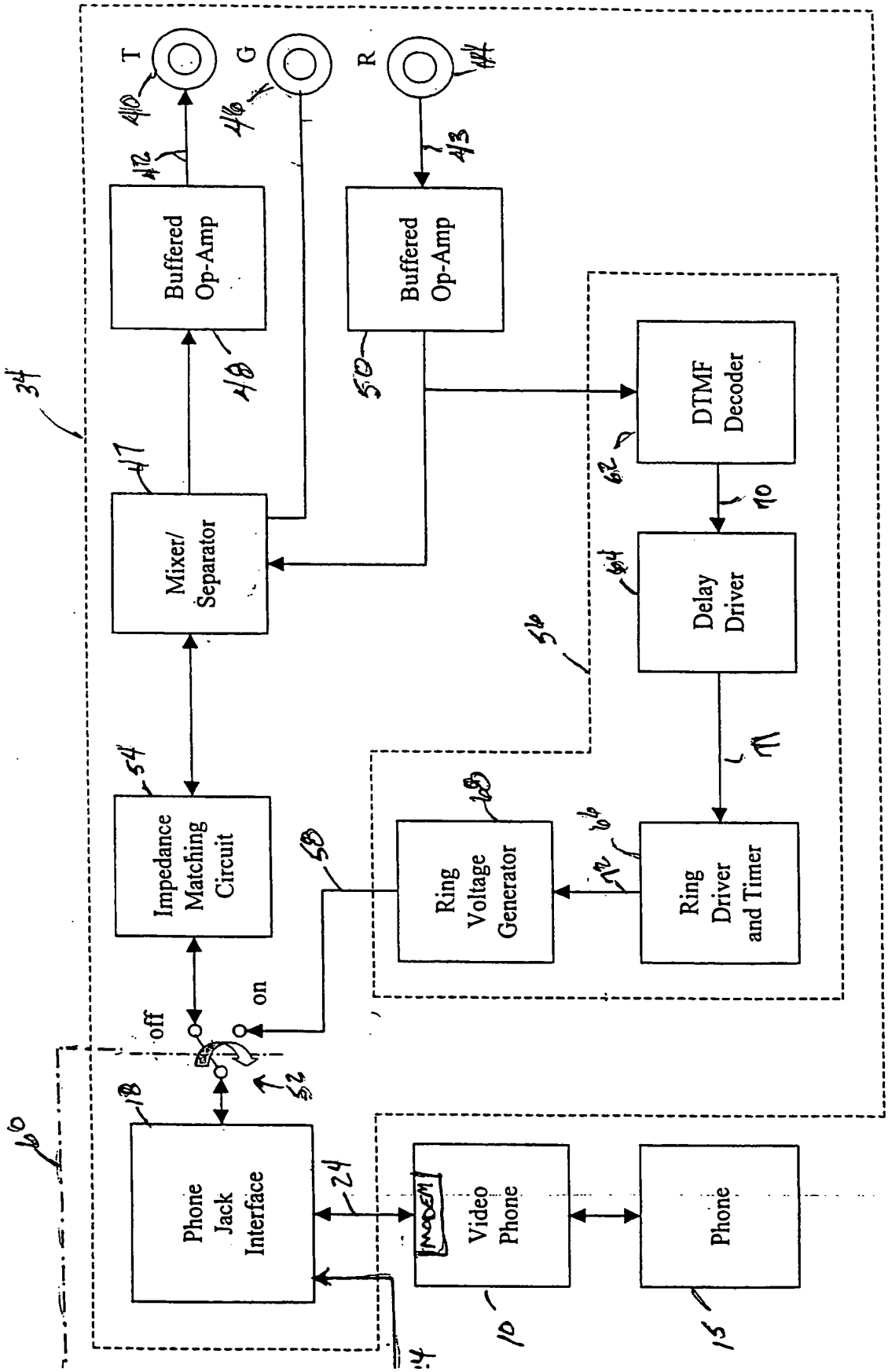

FIG. 3

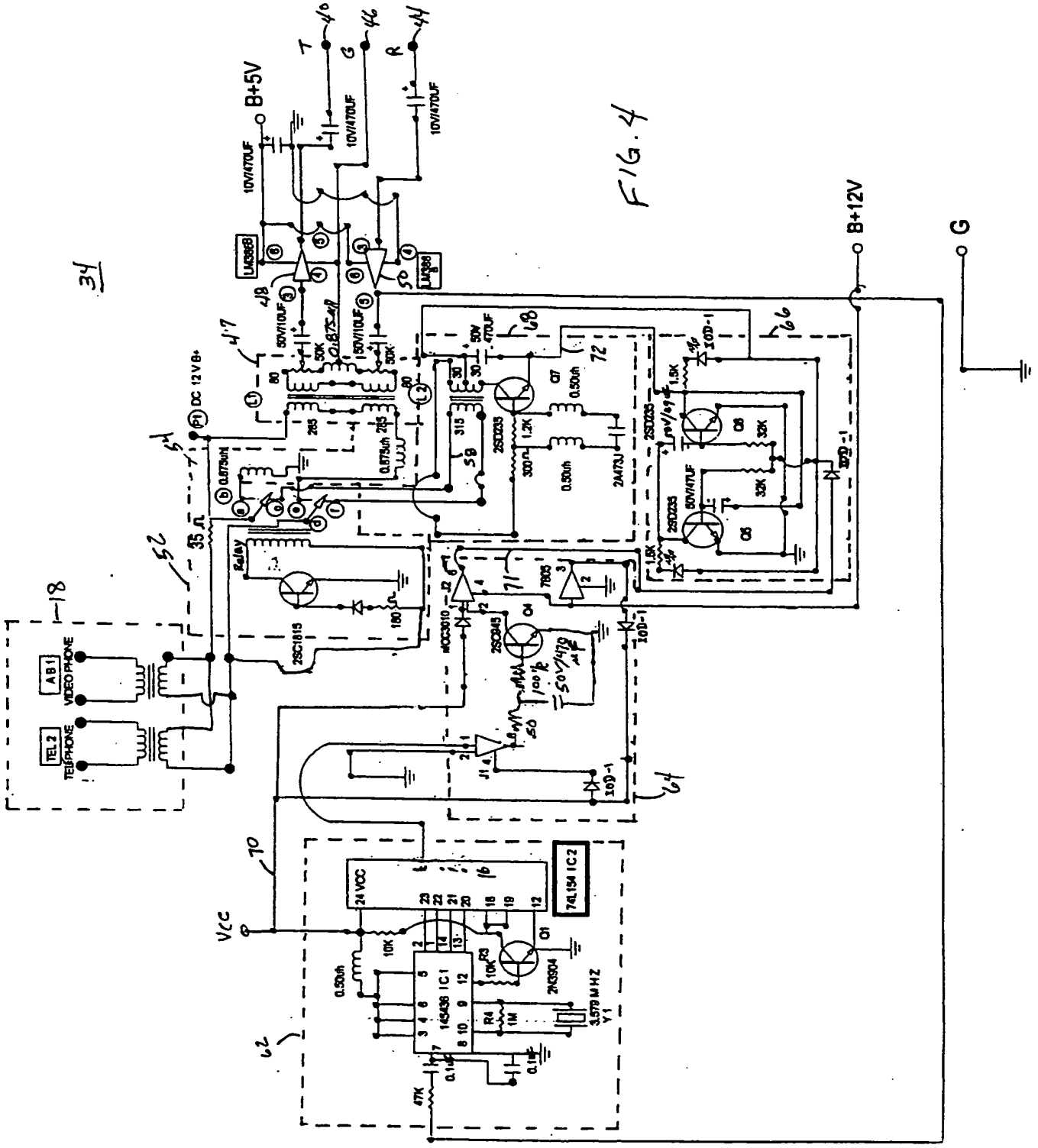

FIG. 4

INTERNATIONAL SEARCH REPORT

Inter onal Application No
PCT/US 00/17243

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04N7/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 296 01 873 U (LINDEMANN ET AL) 4 July 1996 (1996-07-04) the whole document	1,8
A	US 5 734 703 A (HIYOSHI) 31 March 1998 (1998-03-31) abstract	1,8

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
5 September 2000	11/09/2000

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Information on patent family members

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